

## AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1 1. (Cancelled)

2 2. (Currently amended) ~~The method of claim 1, further comprising, prior~~

3 ~~to d)~~ A computer-implemented method for randomly walking through a hyper-

4 text-linked document set comprising a plurality of documents, wherein at least a

5 subset of the documents contain a plurality of links to other documents, each

6 document being associated with a host, the method comprising:

7 a) selecting a host;

8 b) selecting at random a document associated with the host;

9 c) retrieving the selected document;

10 e.1 d) responsive to occurrence of a random event:

11 e.1.1 d.1) selecting at random a host from among the pre-

12 viously selected hosts; and

13 d.2) selecting at random a document associated with the

14 host; and

15 d.3) retrieving the selected document;

16 e.1.2) repeating b) through f);

e) responsive to non-occurrence of the random event:

17 e.1) selecting at random a link in the retrieved document;  
18 and  
19 e.2) retrieving a document referenced by the selected link;  
20 and  
21 f) repeating d) and e) until a predetermined condition is met.

22 and wherein f) comprises repeating c.1) through e) until a predetermined-  
23 condition is met.

14  
1 3. (Currently amended) The method of claim 1, ~~further comprising, prior~~  
2 ~~to d)~~ 2, wherein the random event comprises:

3 ~~e.1) generating a random number;~~  
4 ~~e.2) determining whether the a generated random number falls~~  
5 ~~falling within a predetermined range; and~~  
6 ~~e.3) responsive to the random number falling within the prede-~~  
7 ~~termined range:~~  
8 ~~e.1.1) selecting at random a host from among the previously~~  
9 ~~selected hosts; and~~  
10 ~~e.1.2) repeating b) through f).~~

1 4. (Currently Amended) The method of claim 1 ~~2~~, wherein the document  
2 set is the World Wide Web, and wherein each document is a web page.

1 5. (Original) The method of claim 4, wherein each host corresponds to a  
2 domain.

1 6. (Currently amended) The method of claim ~~1~~ 2, further comprising, con-  
2 currently with a) through f), performing a second two-level random walk through  
3 the hypertext-linked document set.

1 7. (Currently amended) A computer-implemented method for randomly  
2 walking through a hypertext-linked document set comprising a plurality of  
3 documents, wherein at least a subset of the documents contain a plurality of links  
4 to other documents, each document being associated with a host, the method  
5 comprising:

- 6 a) initializing a host set;
- 7 b) initializing a document set for each host in the host set;
- 8 c) selecting at random a host from the host set;
- 9 d) selecting at random a document from the document set of the  
10 selected host;
- 11 ~~e) adding the selected host to the host set;~~
- 12 ~~f) adding the selected document to the document set of the se-~~  
13 ~~lected host;~~
- 14 g e) responsive to the selected document containing at least one  
15 link:

16 ~~g.1~~ e.1) selecting at random a link from the selected doc-  
17 ument;  
18 ~~g.2~~ e.2) selecting a document corresponding to the se-  
19 lected link;  
20 ~~g.3~~ e.3) selecting a host corresponding to the selected  
21 document;  
22 e.4) adding the selected host to the host set;  
23 e.5) adding the selected document to the document set of  
24 the selected host; and  
25 ~~g.4~~ e.6) repeating e.1) through h e.5) until a first prede-  
26 termined condition is met; and  
27 ~~h f)~~ responsive to the selected document not containing at least  
28 ~~one link~~; repeating c) through ~~h e)~~ until a second predeter-  
29 mined condition is met.

1 8. (Currently amended) The method of claim 7, wherein:

2 e.4) is performed responsive to the selected host not being in the host  
3 set; and  
4 f e.5) is performed responsive to the selected document not being in  
5 the document set of the selected host.

1 9. (Currently amended) ~~The method of claim 7, wherein g) further com-~~  
2 ~~prises, prior to g.1)~~ A computer-implemented method for randomly walking

3 through a hypertext-linked document set comprising a plurality of documents,  
4 wherein at least a subset of the documents contain a plurality of links to other  
5 documents, each document being associated with a host, the method comprising:

- 6 a) initializing a host set;  
7 b) initializing a document set for each host in the host set;  
8 c) selecting at random a host from the host set;  
9 d) selecting at random a document from the document set of the  
10 selected host;  
11 e) responsive to non-occurrence of a random event, and further  
12 responsive to the selected document containing at least one  
13 link;  
14 e.1) selecting at random a link from the selected document;  
15 e.2) selecting a document corresponding to the selected  
16 link;  
17 e.3) selecting a host corresponding to the selected doc-  
18 ument;  
19 e.4) adding the selected host to the host set;  
20 e.5) adding the selected document to the document set of  
21 the selected host; and  
22 e.6) repeating e.1) through e.5) until a first predetermined  
23 condition is met; and

24 f) repeating c) through e) until a second predetermined con-  
25 dition is met  
26 g.0) ~~responsive to a random event, repeating c) through h) until a~~  
27 ~~predetermined condition is met;~~  
28 and wherein g.1) through g.4) are performed responsive to non-occurrence  
29 of the random event of g.0).

1 10. (Currently amended) The method of claim 7, ~~further comprising, prior~~  
2 ~~to g.1):~~ 9, wherein the random event comprises:

3 g.0.1) ~~generating a random number;~~  
4 g.0.2) ~~determining whether the~~ a generated random number falls  
5 falling within a predetermined range; ~~and~~  
6 g.0.3) ~~responsive to the random number falling within the prede-~~  
7 ~~termined range, repeating c) through h) until a predetermined~~  
8 ~~condition is met;~~

9 and wherein g.1) through g.4) are performed responsive to the random  
10 number not falling within a predetermined range.

1 11. (Original) The method of claim 7, wherein the hypertext-linked docu-  
2 ment set is the World Wide Web, and wherein each document is a web page.

1 12. (Original) The method of claim 11, wherein each host corresponds to a  
2 domain.

1 13. (Original) A computer-implemented method for measuring relative  
2 quality of a search engine index, comprising:

- 3 a) performing a two-level random walk among documents  
4 within a document set;  
5 b) for each document encountered in the random walk, deter-  
6 mining whether the document is indexed by the search engine  
7 index; and  
8 c) aggregating the results of b).

1 14. (Original) The method of claim 13, wherein at least a subset of the  
2 documents contain a plurality of links to other documents, each document being  
3 associated with a host, and wherein a) comprises:

- 4 a.1) selecting a host;  
5 a.2) selecting at random a document associated with the host;  
6 a.3) retrieving the selected document;  
7 a.4) selecting at random a link in the retrieved document;  
8 a.5) retrieving a document referenced by the selected link; and  
9 a.6) repeating a.4) and a.5) until a predetermined condition is met.

1 15. (Currently amended) ~~The method of claim 14, further comprising,~~  
2 ~~prior to a.4):~~ A computer-implemented method for measuring relative quality of a  
3 search engine index, comprising:

4 a) performing a two-level random walk among documents  
5 within a document set, by:

6 a.1) selecting a host;

7 a.2) selecting at random a document associated with the  
8 host;

9 a.3) retrieving the selected document;

10 a.3.1) responsive to occurrence of a random event:

11 a.3.1.1) selecting at random a host from among  
12 the previously selected hosts; and

13 a.3.1.2) selecting at random a document associ-  
14 ated with the host; and

15 a.3.1.3) retrieving the selected document;

16 a.3.1.2) repeating a.2) through a.6);

17 a.3.2) responsive to non-occurrence of the random event:

18 a.4) selecting at random a link in the retrieved  
19 document; and

20 a.5) retrieving a document referenced by the selected  
21 link; and



- 22                    a.6) repeating a.3.1) through a.5) until a predetermined  
23                    condition is met;  
24                    b) for each document encountered in the random walk, deter-  
25                    mining whether the document is indexed by the search engine  
26                    index; and  
27                    c) aggregating the results of b).

1                    16. (Original) The method of claim 13, wherein at least a subset of the  
2 documents contain a plurality of links to other documents, each document being  
3 associated with a host, and wherein a) comprises:  
4                    a.1) initializing a host set;  
5                    a.2) initializing a document set for each host in the host set;  
6                    a.3) selecting at random a host from the host set;  
7                    a.4) selecting at random a document from the document set of the  
8                    selected host;  
9                    a.5) adding the selected host to the host set;  
10                    a.6) adding the selected document to the document set of the se-  
11                    lected host;  
12                    a.7) responsive to the selected document containing at least one  
13                    link:  
14                    a.7.1) selecting at random a link from the selected document;

- 15 a.7.2) selecting a document corresponding to the selected  
16 link;  
17 a.7.3) selecting a host corresponding to the selected doc-  
18 ument;  
19 a.7.4) repeating a.5) through a.8) until a predetermined con-  
20 dition is met; and  
21 a.8) responsive to the selected document not containing at least  
22 one link, repeating a.3) through a.8) until a predetermined  
23 condition is met.

1 17. (Original) The method of claim 16, wherein:

- 2 a.5) is performed responsive to the selected host not being in the host  
3 set; and  
4 a.6) is performed responsive to the selected document not being in  
5 the document set of the selected host.

1 18. (Original) The method of claim 13, wherein each document contains a  
2 plurality of words, and wherein b) comprises, for each document encountered in  
3 the random walk:

- 4 b.1) selecting at least one word from the document;  
5 b.2) performing a query on the search engine index based on the  
6 selected at least one word, to obtain search results; and

7 b.3) determining whether the document is included in the ob-  
8 tained search results.

1 19. (Original) The method of claim 18, wherein b.1) comprises selecting at  
2 least one word based on rarity.

1 20. (Currently amended) A computer-implemented method for measuring  
2 relative quality of a target document in a document set, comprising:

- 3 a) performing a two-level random walk among documents  
4 within a document set; and  
5 b) determining a quality metric responsive to the number of  
6 times the target document is encountered in the random walk.

1 21. (Currently amended) A computer-implemented method for measuring  
2 relative quality of a target document in a document set comprising a plurality of  
3 documents, wherein at least a subset of the documents contain a plurality of links  
4 to other documents, the method comprising:

- 5 a) performing a two-level random walk among documents  
6 within a document set; and  
7 b) determining a quality metric responsive to the number of  
8 documents encountered during the two-level random walk  
9 that link to the target document.

1 22. (Currently amended) The method of claim 21, wherein b) comprises  
2 determining a quality metric responsive to the number of documents that link to  
3 the target document, and responsive to the quality metric of the linking docu-  
4 ments.

1 23. (Currently amended) The method of claim 21, wherein b) comprises  
2 determining a value for:

3 
$$R(p) = d / T + (1 - d) \sum_{i=1}^k R(p_i) / C(p_i)$$

4 where:

5 R(p) is the PageRank of target document p;

6 R(p<sub>i</sub>) is the PageRank of document p<sub>i</sub>;

7 T is the total number of documents in the document set;

8 d is a damping factor such that 0 < d < 1;

9 documents p<sub>1</sub>, ... , p<sub>k</sub> each contain at least one link to target document p;

10 and

11 C(p<sub>i</sub>) is the number of links out of document p<sub>i</sub>.

1 24. (Currently amended) ~~The method of claim 21, A computer-~~  
2 implemented method for measuring relative quality of a target document in a  
3 document set comprising a plurality of documents, wherein at least a subset of the  
4 documents contain a plurality of links to other documents, wherein each docu-  
5 ment is associated with a host, and wherein a) comprises the method comprising:

6 a) performing a two-level random walk among documents

7 within a document set, by:

8 a.1) selecting a host;

9 a.2) selecting at random a document associated with the  
10 host;

11 a.3) retrieving the selected document;

12 a.4) responsive to occurrence of a random event:

13 a.4.1) selecting at random a host from among the pre-  
14 viously selected hosts; and

15 a.4.2) selecting at random a document associated with  
16 the host; and

17 a.4.3) retrieving the selected document;

18 a.4.2) repeating a.2) through a.7);

19 a.5) responsive to non-occurrence of the random event:

20 a.5 a.5.1) selecting at random a link in the retrieved  
21 document; and

22 a.6 a.5.2) retrieving a document referenced by the  
23 selected link; and

24 a.7 a.6) repeating a.4) to a.6 a.5) until a predetermined  
25 condition is met; and

26                   b) determining a quality metric responsive to the number of  
27                   documents encountered during the two-level random walk  
28                   that link to the target document.

29  
1           25. (Currently amended) ~~The method of claim 21,~~ A computer-  
2           implemented method for measuring relative quality of a target document in a  
3           document set comprising a plurality of documents, wherein at least a subset of the  
4           documents contain a plurality of links to other documents, wherein each docu-  
5           ment is associated with a host, and wherein a) comprises: the method comprising:

6                   a) performing a two-level random walk among documents  
7                   within a document set, by:

- 8                   a.1) initializing a host set;  
9                   a.2) initializing a document set for each host in the host set;  
10                  a.3) selecting at random a host from the host set;  
11                  a.4) responsive to occurrence of a random event:

12                       a.4.1) selecting at random a host from among the pre-  
13                       viously selected hosts; ~~and~~

14                       ~~a.4.2) repeating a.2) through a.7).~~

15                   a.5) responsive to non-occurrence of the random event:

16                       a.5 a.5.1) selecting at random a document from the  
17                       document set of the selected host; and

18 a.6) — adding the selected host to the host set;  
19 a.7) — adding the selected document to the document  
20 set of the selected host;  
21 a.8 a.5.2) responsive to the selected document  
22 containing at least one link:  
23 a.8.1 a.5.2.1) selecting at random a link from the  
24 selected document;  
25 a.8.2 a.5.2.2) selecting a document correspond-  
26 ing to the selected link;  
27 a.8.3 a.5.2.3) selecting a host corresponding to  
28 the selected document; and  
29 a.5.2.4) adding the selected host to the host  
30 set;  
31 a.5.2.5) adding the selected document to  
32 the document set of the selected host;  
33 a.8.4 a.5.2.6) repeating a.6 a.5.2.1) through a.9  
34 a.5.2.5) until a first predetermined condi-  
35 tion is met; and  
36 a.9 a.6) ~~responsive to the selected document not con-~~  
37 ~~taining at least one link;~~ repeating a.3) through a.9 a.5)  
38 until a second predetermined condition is met; and

39                   b) determining a quality metric responsive to the number of  
40                   documents encountered during the two-level random walk  
41                   that link to the target document.

1           26. (Currently amended) The method of claim 21, further comprising:

- 2                   c)     determining a quality metric for at least one additional target  
3                   document; and  
4                   d)     ranking the quality metric of the first target document with  
5                   respect to the quality metrics of the additional target docu-  
6                   ments.

1           27. (Currently amended) A computer-implemented method for randomly  
2 walking through a hypertext-linked document set comprising a plurality of  
3 documents, wherein at least a subset of the documents contain a plurality of links  
4 to other documents, each document being associated with a host, the method  
5 comprising:

- 6                   a)     selecting a host;  
7                   b)     selecting at random a document associated with the host;  
8                   c)     retrieving the selected document;  
9                   d)     responsive to occurrence of a random event:  
10                   d.1) selecting at random a host from among the previously  
11                   selected hosts; and



- 12 d.2) repeating b) through e) until a predetermined con-  
13 dition is met; and  
14 e) responsive to non-occurrence of the random event ~~not occur-~~  
15 ~~ring~~;  
16 e.1) selecting at random a link in the retrieved document;  
17 e.2) retrieving a document referenced by the selected link;  
18 and  
19 e.3) repeating d) and e) until a predetermined condition is  
20 met.

28. (Currently amended) A computer-implemented method for measuring  
relative quality of a target document in a document set comprising a plurality of  
documents, wherein at least a subset of the documents contain a plurality of links  
to other documents, the method comprising:

- a) performing a two-level random walk among documents  
within a document set, ~~the two-level random walk compris-~~  
~~ing by~~:  
a.1) initializing a host set;  
a.2) initializing a document set for each host in the host set;  
a.3) selecting at random a host from the host set;  
a.4) responsive to occurrence of a random event:

12 a.4.1) selecting at random a host from among the pre-  
13 viously selected hosts; and

14 ~~a.4.2) repeating a.2) through a.7).~~

15 a.5) responsive to non-occurrence of the random event:

16 ~~a.5~~ a.5.1) selecting at random a document from the  
17 document set of the selected host; and

18 ~~a.6) adding the selected host to the host set;~~

19 ~~a.7) adding the selected document to the document~~  
20 ~~set of the selected host;~~

21 ~~a.8~~ a.5.2) responsive to the selected document  
22 containing at least one link:

23 ~~a.8.1~~ a.5.2.1) selecting at random a link from the  
24 selected document;

25 ~~a.8.2~~ a.5.2.2) selecting a document correspond-  
26 ing to the selected link;

27 ~~a.8.3~~ a.5.2.3) selecting a host corresponding to  
28 the selected document; and

29 a.5.2.4) adding the selected host to the host  
30 set;

31 a.5.2.5) adding the selected document to  
32 the document set of the selected host;

33 ~~a.8.4 a.5.2.6)~~ repeating a.6 a.5.2.1) through a.9  
34 a.5.2.5) until a first predetermined condi-  
35 tion is met; and  
36 a.9 a.6) ~~responsive to the selected document not con-~~  
37 ~~taining at least one link, repeating a.3) through a.9 a.5)~~  
38 until a second predetermined condition is met; and  
39 b) determining a quality metric responsive to the number of  
40 documents encountered during the two-level random walk  
41 that link to the target document;  
42 c) determining a quality metric for at least one additional target  
43 document; and  
44 d) ranking the quality metric of the first document with respect  
45 to the quality metrics of the additional target documents.

1 29. (Cancelled)

1 ~~30. (Currently amended) The computer program product of claim 29, fur-~~  
2 ~~ther comprising computer-readable program code devices configured to cause a~~  
3 ~~computer to, prior to selecting at random a link in the retrieved document A~~  
4 ~~computer program product comprising a computer-usable medium having com-~~  
5 ~~puter-readable code embodied therein for randomly walking through a hypertext-~~  
6 ~~linked document set comprising a plurality of documents, wherein at least a sub-~~

7 set of the documents contain a plurality of links to other documents, each docu-  
8 ment being associated with a host, the computer program product comprising:

9 a) computer-readable program code devices configured to cause  
10 a computer to select a host;

11 b) computer-readable program code devices configured to cause  
12 a computer to select at random a document associated with  
13 the host;

14 c) computer-readable program code devices configured to cause  
15 a computer to retrieve the selected document;

16 e-1 d) computer-readable program code devices configured to cause  
17 a computer to, responsive to occurrence of a random event:

18 d.1) select at random a host from among the previously se-  
19 lected hosts; and

20 d.2) select at random a document associated with the host;  
21 and

22 d.3) retrieve the selected document;

23 repeat the operations of b) through f);

24 e) computer-readable program code devices configured to cause  
25 a computer to, responsive to non-occurrence of the random  
26 event:

27 e.1) select at random a link in the retrieved document; and

28 e.2) retrieve a document referenced by the selected link;  
29 and  
30 f) computer-readable program code devices configured to cause  
31 a computer to repeat the operations of d) and e) until a pre-  
32 determined condition is met.

33 ~~and wherein the computer-readable program code devices configured to~~  
34 ~~cause a computer to repeat the operations of d) and e) until a predetermined con-~~  
35 ~~dition is met comprise computer-readable program code devices configured to~~  
36 ~~cause a computer to repeat the operations of c.1) through e) until a predetermined~~  
37 ~~condition is met.~~

1 31. (Currently amended) The computer program product of claim 29 30,  
2 wherein the random event comprises further comprising:  
3 ~~computer-readable program code devices configured to cause a com-~~  
4 ~~puter to generate a random number;~~  
5 ~~computer-readable program code devices configured to cause a com-~~  
6 ~~puter to determine whether the a generated random number~~  
7 ~~falls falling within a predetermined range; and~~  
8 ~~computer-readable program code devices configured to cause a com-~~  
9 ~~puter to, responsive to the random number falling within the~~  
10 ~~predetermined range:~~

11 ~~select at random a host from among the previously selected~~  
12 ~~hosts; and~~  
13 ~~repeat the operations of b) through f).~~

1 32. (Currently amended) The computer program product of claim 29 30,  
2 wherein the document set is the World Wide Web, and wherein each document is  
3 a web page.

1 33. (Original) The computer program product of claim 32, wherein each  
2 host corresponds to a domain.

14  
1 34. (Original) The computer program product of claim 29 30, further com-  
2 prising computer-readable program code devices configured to cause a computer  
3 to, concurrently with the operations of a) through f), perform a second two-level  
4 random walk through the hypertext-linked document set.

1 35. (Currently amended) A computer program product comprising a com-  
2 puter-usable medium having computer-readable code embodied therein for ran-  
3 domly walking through a hypertext-linked document set comprising a plurality of  
4 documents, wherein at least a subset of the documents contain a plurality of links  
5 to other documents, each document being associated with a host, the computer  
6 program product comprising:

- 7 a) computer-readable program code devices configured to cause  
8 a computer to initialize a host set;
- 9 b) computer-readable program code devices configured to cause  
10 a computer to initialize a document set for each host in the  
11 host set;
- 12 c) computer-readable program code devices configured to cause  
13 a computer to select at random a host from the host set;
- 14 d) computer-readable program code devices configured to cause  
15 a computer to select at random a document from the docu-  
16 ment set of the selected host;
- 17 ~~e) computer-readable program code devices configured to cause~~  
18 ~~a computer to add the selected host to the host set;~~
- 19 ~~f) computer-readable program code devices configured to cause~~  
20 ~~a computer to add the selected document to the document set~~  
21 ~~of the selected host;~~
- 22 g e) computer-readable program code devices configured to cause  
23 a computer to, responsive to the selected document contain-  
24 ing at least one link:
- 25 g-1 e.1) select at random a link from the selected docu-  
26 ment;
- 27 g-2 e.2) select a document corresponding to the selected  
28 link;

14

29 ~~g.3~~ e.3) select a host corresponding to the selected docu-  
30 ment; and  
31 e.4) add the selected host to the host set;  
32 e.5) add the selected document to the document set of the  
33 selected host; and  
34 ~~g.4~~ e.6) repeat the operations of ~~e.1)~~ through ~~h~~ e.5) un-  
35 til a first predetermined condition is met; and  
36 h) computer-readable program code devices configured to cause  
37 a computer to, ~~responsive to the selected document not con-~~  
38 ~~taining at least one link,~~ repeat the operations of c) through h  
39 e) until a second predetermined condition is met.

1 36. (Original) The computer program product of claim 35, wherein:  
2 the computer-readable program code devices configured to cause a  
3 computer to add the selected host to the host set operate re-  
4 sponsive to the selected host not being in the host set; and  
5 the computer-readable program code devices configured to cause a  
6 computer to add the selected document to the document set  
7 of the selected host operate responsive to the selected docu-  
8 ment not being in the document set of the selected host.

1 37. (Currently amended) ~~The computer program product of claim 35,~~  
2 ~~wherein computer-readable program code devices g) further comprise computer-~~



3 ~~readable program code devices configured to cause a computer to, prior to g.1) A~~  
4 computer program product comprising a computer-usable medium having com-  
5 puter-readable code embodied therein for randomly walking through a hypertext-  
6 linked document set comprising a plurality of documents, wherein at least a sub-  
7 set of the documents contain a plurality of links to other documents, each docu-  
8 ment being associated with a host, the computer program product comprising:

- 9 a) computer-readable program code devices configured to cause  
10 a computer to initialize a host set;  
11 b) computer-readable program code devices configured to cause  
12 a computer to initialize a document set for each host in the  
13 host set;  
14 c) computer-readable program code devices configured to cause  
15 a computer to select at random a host from the host set;  
16 d) computer-readable program code devices configured to cause  
17 a computer to select at random a document from the docu-  
18 ment set of the selected host;  
19 e) computer-readable program code devices configured to cause  
20 a computer to, responsive to non-occurrence of a random  
21 event, and further responsive to the selected document con-  
22 taining at least one link:  
23 e.1) select at random a link from the selected document;  
24 e.2) select a document corresponding to the selected link;

25 e.3) select a host corresponding to the selected document;  
26 and  
27 e.4) add the selected host to the host set;  
28 e.5) add the selected document to the document set of the  
29 selected host; and  
30 e.6) repeat the operations of e.1) through e.5) until a first  
31 predetermined condition is met; and  
32 f) computer-readable program code devices configured to cause  
33 a computer to repeat the operations of c) through e) until a  
34 second predetermined condition is met.  
35 ~~g.0) responsive to a random event, repeat the operations of c)~~  
36 ~~through h) until a predetermined condition is met;~~  
37 ~~and wherein computer-readable program code devices g) are configured to~~  
38 ~~cause a computer to perform g.1) through g.4) responsive to non-occurrence of the~~  
39 ~~random event of g.0).~~

1 38. (Currently amended) The computer program product of claim 35,  
2 ~~wherein computer-readable program code devices g) further comprise computer-~~  
3 ~~readable program code devices configured to cause a computer to, prior to g.1) 37,~~  
4 wherein the random event comprises:  
5 ~~g.0.1) generate a random number;~~

6 ~~g.0.2) determine whether the a generated random number falls fal-~~  
7 ~~ling within a predetermined range; and~~

8 ~~g.0.3) responsive to the random number falling within the prede-~~  
9 ~~termined range, repeat the operations of c) through h) until a~~  
10 ~~predetermined condition is met;~~

11 ~~and wherein computer-readable program code devices g) are configured to~~  
12 ~~cause a computer to perform g.1) through g.4) responsive to the random number~~  
13 ~~not falling within a predetermined range.~~

1 39. (Original) The computer program product of claim 35, wherein the hy-  
2 pertext-linked document set is the World Wide Web, and wherein each document  
3 is a web page.

1 40. (Original) The computer program product of claim 39, wherein each  
2 host corresponds to a domain.

1 41. (Original) A computer program product comprising a computer-usable  
2 medium having computer-readable code embodied therein for measuring relative  
3 quality of a search engine index, the computer program product comprising:

4 a) computer-readable program code devices configured to cause  
5 a computer to perform a two-level random walk among  
6 documents within a document set;

- 7           b)     computer-readable program code devices configured to cause  
8                 a computer to, for each document encountered in the random  
9                 walk, determine whether the document is indexed by the  
10                search engine index; and  
11           c)     computer-readable program code devices configured to cause  
12                 a computer to aggregate the results of the operations of b).

1           42. (Original) The computer program product of claim 41, wherein at least  
2     a subset of the documents contain a plurality of links to other documents, each  
3     document being associated with a host, and wherein the computer-readable pro-  
4     gram code devices configured to cause a computer to perform a two-level random  
5     walk comprise:

- 6           a.1)   computer-readable program code devices configured to cause  
7                 a computer to select a host;  
8           a.2)   computer-readable program code devices configured to cause  
9                 a computer to select at random a document associated with  
10                the host;  
11           a.3)   computer-readable program code devices configured to cause  
12                 a computer to retrieve the selected document;  
13           a.4)   computer-readable program code devices configured to cause  
14                 a computer to select at random a link in the retrieved doc-  
15                 ument;

- 16 a.5) computer-readable program code devices configured to cause  
17 a computer to retrieve a document referenced by the selected  
18 link; and  
19 a.6) computer-readable program code devices configured to cause  
20 a computer to repeat the operations of a.4) and a.5) until a  
21 predetermined condition is met.

1 43. (Currently amended) ~~The computer program product of claim 42, fur-~~  
2 ~~ther comprising computer-readable program code devices configured to cause a~~  
3 ~~computer to, prior to selecting at random a link in the retrieved document~~ A  
4 computer program product comprising a computer-usable medium having com-  
5 puter-readable code embodied therein for measuring relative quality of a search  
6 engine index, the computer program product comprising:

- 7 a) computer-readable program code devices configured to cause  
8 a computer to perform a two-level random walk among  
9 documents within a document set, wherein at least a subset of  
10 the documents contain a plurality of links to other documents,  
11 each document being associated with a host, the two-level  
12 random walk comprising:  
13 a.1) selecting a host;  
14 a.2) selecting at random a document associated with the  
15 host;

- 16 a.3) retrieving the selected document;
- 17 a.3.1) responsive to occurrence of a random event:
- 18 a.3.1.1) selecting at random a host from among  
19 the previously selected hosts; and
- 20 a.3.1.2) selecting at random a document associ-  
21 ated with the host; and
- 22 a.3.1.3) retrieving the selected document;  
23 repeat the operations of a.2) through a.6)
- 24 a.3.2) responsive to non-occurrence of the random event:
- 25 a.4) selecting at random a link in the retrieved  
26 document; and
- 27 a.5) retrieving a document referenced by the selected  
28 link; and
- 29 a.6) repeating a.3.1) through a.5) until a predetermined  
30 condition is met;
- 31 b) computer-readable program code devices configured to cause  
32 a computer to, for each document encountered in the random  
33 walk, determine whether the document is indexed by the  
34 search engine index; and
- 35 c) computer-readable program code devices configured to cause  
36 a computer to aggregate the results of the operations of b).

1           44. (Original) The computer program product of claim 41, wherein at least  
2 a subset of the documents contain a plurality of links to other documents, each  
3 document being associated with a host, and wherein the computer-readable pro-  
4 gram code devices configured to cause a computer to perform a two-level random  
5 walk comprise:

- 6           a.1) computer-readable program code devices configured to cause  
7           a computer to initialize a host set;  
8           a.2) computer-readable program code devices configured to cause  
9           a computer to initialize a document set for each host in the  
10           host set;  
11           a.3) computer-readable program code devices configured to cause  
12           a computer to select at random a host from the host set;  
13           a.4) computer-readable program code devices configured to cause  
14           a computer to select at random a document from the docu-  
15           ment set of the selected host;  
16           a.5) computer-readable program code devices configured to cause  
17           a computer to add the selected host to the host set;  
18           a.6) computer-readable program code devices configured to cause  
19           a computer to add the selected document to the document set  
20           of the selected host;

21 a.7) computer-readable program code devices configured to cause  
22 a computer to, responsive to the selected document contain-  
23 ing at least one link:  
24 a.7.1) select at random a link from the selected document;  
25 a.7.2) select a document corresponding to the selected link;  
26 a.7.3) select a host corresponding to the selected document;  
27 a.7.4) repeat the operations of a.5) through a.8) until a prede-  
28 termined condition is met; and  
29 a.8) computer-readable program code devices configured to cause  
30 a computer to, responsive to the selected document not con-  
31 taining at least one link, repeat the operations of a.3) through  
32 a.8) until a predetermined condition is met.

1 45. (Original) The computer program product of claim 44, wherein:  
2 the computer-readable program code devices configured to cause a  
3 computer to add the selected host to the host set are config-  
4 ured to cause a computer to add the selected host responsive  
5 to the selected host not being in the host set; and  
6 the computer-readable program code devices configured to cause a  
7 computer to add the selected document to the document set  
8 of the selected host are configured to cause a computer to add



9 the selected document responsive to the selected document  
10 not being in the document set of the selected host.

1 46. (Currently amended) The computer program product of claim 41,  
2 wherein each document contains a plurality of words, and wherein the computer-  
3 readable program code devices configured to cause a computer to, determine  
4 whether the document is indexed by the search engine index comprise computer-  
5 readable program code devices configured to, for each document encountered in  
6 the random walk:

- 7 b.1) select at least one word from the document;  
8 b.2) perform a query on the search engine index based on the se-  
9 lected at least one word, to obtain search results; and  
10 b.3) determine whether the document is included in the obtained  
11 search results.

1 47. (Original) The computer program product of claim 46, wherein the  
2 computer-readable program code devices configured to select at least one word  
3 from the document comprise computer-readable program code devices configured  
4 to select at least one word based on rarity.

1 48. (Currently amended) A computer program product comprising a com-  
2 puter-usable medium having computer-readable code embodied therein for mea-

3   suring relative quality of a target document in a document set, the computer pro-  
4   gram product comprising:

5           computer-readable program code devices configured to cause a com-  
6           puter to perform a two-level random walk among documents  
7           within a document set; and

8           computer-readable program code devices configured to cause a com-  
9           puter to determine a quality metric responsive to the number  
10          of times the target document is encountered in the random  
11          walk.

1           49. (Currently amended) A computer program product comprising a com-  
2   puter-usable medium having computer-readable code embodied therein for  
3   measuring relative quality of a target document in a document set comprising a  
4   plurality of documents, wherein at least a subset of the documents contain a plu-  
5   rality of links to other documents, the computer program product comprising:

6           computer-readable program code devices configured to cause a com-  
7           puter to perform a two-level random walk among documents  
8           within a document set; and

9           computer-readable program code devices configured to cause a com-  
10          puter to determine a quality metric responsive to the number  
11          of documents encountered during the two-level random walk  
12          that link to the target document.

1 50. (Currently amended) The computer program product of claim 49,  
2 wherein the computer-readable program code devices configured to cause a com-  
3 puter to determine a quality metric comprise computer-readable program code  
4 devices configured to cause a computer to determine a quality metric responsive  
5 to the number of documents that link to the target document, and responsive to  
6 the quality metric of the linking documents.

1 51. (Currently amended) The computer program product of claim 49,  
2 wherein the computer-readable program code devices configured to cause a com-  
3 puter to determine a quality metric comprise computer-readable program code  
4 devices configured to cause a computer to determine a value for:

5 
$$R(p) = d / T + (1 - d) \sum_{i=1}^k R(p_i) / C(p_i)$$

6 where:

7 R(p) is the PageRank of target document p;

8 R(p<sub>i</sub>) is the PageRank of document p<sub>i</sub>;

9 T is the total number of documents in the document set;

10 d is a damping factor such that  $0 < d < 1$ ;

11 documents p<sub>1</sub>, ... , p<sub>k</sub> each contain at least one link to target document p;

12 and

13 C(p<sub>i</sub>) is the number of links out of document p<sub>i</sub>.

1 52. (Currently amended) ~~The computer program product of claim 49, A~~  
2 computer program product comprising a computer-usable medium having com-  
3 puter-readable code embodied therein for measuring relative quality of a target  
4 document in a document set comprising a plurality of documents, wherein at least  
5 a subset of the documents contain a plurality of links to other documents, and  
6 wherein each document is associated with a host, and ~~wherein the computer-~~  
7 ~~readable program code devices configured to cause a computer to perform a two-~~  
8 ~~level random walk comprise~~ the computer program product comprising:

9 computer-readable program code devices configured to cause a com-  
10 puter to perform a two-level random walk among documents  
11 within a document set, by:

- 12 a.1) ~~computer-readable program code devices configured-~~  
13 ~~to cause a computer to selecting~~ a host;  
14 a.2) ~~computer-readable program code devices configured-~~  
15 ~~to cause a computer to selecting~~ at random a document  
16 associated with the host;  
17 a.3) ~~computer-readable program code devices configured-~~  
18 ~~to cause a computer to retrieve~~ retrieving the selected  
19 document;

20 a.4) ~~computer-readable program code devices configured~~  
21 ~~to cause a computer to~~, responsive to occurrence of a  
22 random event:

23 a.4.1) selecting at random a host from among the pre-  
24 viously selected hosts; and

25 a.4.2) selecting at random a document associated with  
26 the host; and

27 a.4.3) retrieving the selected document;

28 ~~a.4.2) repeat the operations of a.2) through a.7);~~

29 a.5) responsive to non-occurrence of the random event:

30 a.5 a.6) ~~computer-readable program code devices~~  
31 ~~configured to cause a computer to~~ selecting at  
32 random a link in the retrieved document; and

33 a.6 a.7) ~~computer-readable program code devices~~  
34 ~~configured to cause a computer to retrieve~~ re-  
35 trieving a document referenced by the selected  
36 link; and

37 a.7 a.8) ~~computer-readable program code devices con-~~  
38 ~~figured to cause a computer to~~ repeating the operations  
39 of a.4) to a.6 a.7) until a predetermined condition is  
40 met; and.

41 computer-readable program code devices configured to cause a com-  
42 puter to determine a quality metric responsive to the number  
43 of documents encountered during the two-level random walk  
44 that link to the target document.

1 53. (Currently amended) ~~The computer program product of claim 49, A~~  
2 computer program product comprising a computer-usable medium having com-  
3 puter-readable code embodied therein for measuring relative quality of a target  
4 document in a document set comprising a plurality of documents, wherein at least  
5 a subset of the documents contain a plurality of links to other documents, wherein  
6 each document is associated with a host, the computer program product compris-  
7 ing and wherein and wherein the computer-readable program code devices con-  
8 figured to cause a computer to perform a two level random walk comprise:

9 computer-readable program code devices configured to cause a com-  
10 puter to perform a two-level random walk among documents  
11 within a document set, by:

- 12 a.1) ~~computer-readable program code devices configured~~  
13 ~~to cause a computer to initialize~~ initializing a host set;  
14 a.2) ~~computer-readable program code devices configured~~  
15 ~~to cause a computer to initialize~~ initializing a document  
16 set for each host in the host set;

17 a.3) ~~computer-readable program code devices configured~~  
18 ~~to cause a computer to selecting~~ at random a host from  
19 the host set;

20 a.4) ~~computer-readable program code devices configured~~  
21 ~~to cause a computer to~~, responsive to occurrence of a  
22 random event;

23 a.4.1) selecting at random a host from among the pre-  
24 viously selected hosts; and

25 ~~a.4.2) repeat the operations of a.2) through a.7).~~

26 a.5) responsive to non-occurrence of the random event:

27 a.5 a.5.1) ~~computer-readable program code devices~~  
28 ~~configured to cause a computer to selecting~~ at  
29 random a document from the document set of  
30 the selected host;

31 a.6 a.5.2) ~~computer-readable program code devices~~  
32 ~~configured to cause a computer to adding~~ the se-  
33 lected host to the host set;

34 a.7 a.5.3) ~~computer-readable program code devices~~  
35 ~~configured to cause a computer to adding~~ the se-  
36 lected document to the document set of the se-  
37 lected host;

38 a.8 a.5.4) ~~computer-readable program code devices~~  
39 ~~configured to cause a computer to~~, responsive to  
40 the selected document containing at least one  
41 link:  
42 a.8.1 a.5.4.1) selecting at random a link from the  
43 selected document;  
44 a.8.2 a.5.4.2) selecting a document correspond-  
45 ing to the selected link;  
46 a.8.3 a.5.4.3) selecting a host corresponding to  
47 the selected document; and  
48 a.8.4 a.5.4.4) repeating the operations of a.6  
49 a.5.2) through a.9 a.5.4.3) until a first pre-  
50 determined condition is met; and  
51 a.9 a.6) ~~responsive to the selected document not~~  
52 ~~containing at least one link~~, repeating the operations of  
53 a.3) through a.9 a.5.4.4) until a second predetermined  
54 condition is met; and  
55 computer-readable program code devices configured to cause a com-  
56 puter to determine a quality metric responsive to the number  
57 of documents encountered during the two-level random walk  
58 that link to the target document.



1           54. (Currently amended) The computer program product of claim 49, fur-  
2 ther comprising:

3           c)     computer-readable program code devices configured to cause  
4                 a computer to determine a quality metric for at least one ad-  
5                 ditional target document; and

6           d)     computer-readable program code devices configured to cause  
7                 a computer to rank the quality metric of the first target docu-  
8                 ment with respect to the quality metrics of the additional tar-  
9                 get documents.

1           55. (Currently amended) A computer program product comprising a com-  
2 puter-usable medium having computer-readable code embodied therein for ran-  
3 domly walking through a hypertext-linked document set comprising a plurality of  
4 documents, wherein at least a subset of the documents contain a plurality of links  
5 to other documents, each document being associated with a host, the computer  
6 program product comprising:

7           a)     computer-readable program code devices configured to cause  
8                 a computer to select a host;

9           b)     computer-readable program code devices configured to cause  
10                 a computer to select at random a document associated with  
11                 the host;

- 12 c) computer-readable program code devices configured to cause  
13 a computer to retrieve the selected document;
- 14 d) computer-readable program code devices configured to cause  
15 a computer to, responsive to occurrence of a random event:
- 16 d.1) select at random a host from among the previously se-  
17 lected hosts; and
- 18 d.2) repeat the operations of b) through e) until a pre-  
19 determined condition is met
- 20 e) computer-readable program code devices configured to cause  
21 a computer to, responsive to non-occurrence of the random  
22 event ~~not occurring~~:
- 23 e.1) select at random a link in the retrieved document;
- 24 e.2) retrieve a document referenced by the selected link;  
25 and
- 26 e.3) repeat the operations of d) and e) until a predeter-  
27 mined condition is met.

1 56. (Currently amended) A computer program product comprising a com-  
2 puter-usable medium having computer-readable code embodied therein for  
3 measuring relative quality of a target document in a document set comprising a  
4 plurality of documents, wherein at least a subset of the documents contain a plu-  
5 rality of links to other documents, the computer program product comprising:

- 6 a) computer-readable program code devices configured to cause  
7 a computer to perform a two-level random walk among  
8 documents within a document set; ~~the computer-readable~~  
9 ~~program code devices comprising by:~~
- 10 a.1) ~~computer-readable program code devices configured to~~  
11 ~~cause a computer to initialize~~ initializing a host set;  
12 a.2) ~~computer-readable program code devices configured to~~  
13 ~~cause a computer to initialize~~ initializing a document set  
14 for each host in the host set;  
15 a.3) ~~computer-readable program code devices configured to~~  
16 ~~cause a computer to selecting~~ at random a host from the  
17 host set;  
18 a.4) ~~computer-readable program code devices configured to~~  
19 ~~cause a computer to, responsive to~~ occurrence of a random  
20 event:  
21 a.4.1) selecting at random a host from among the previ-  
22 ously selected hosts; and  
23 a.4.2) ~~repeat the operations of a.2) through a.7).~~  
24 a.5) responsive to non-occurrence of the random event:  
25 a.5 a.5.1) ~~computer-readable program code devices con-~~  
26 ~~figured to cause a computer to selecting~~ at random

14

27 a document from the document set of the selected  
28 host;  
29 ~~a.6 a.5.2) computer-readable program code devices con-~~  
30 ~~figured to cause a computer to adding~~ the selected  
31 host to the host set;  
32 ~~a.7 a.5.3) computer-readable program code devices con-~~  
33 ~~figured to cause a computer to adding~~ the selected  
34 document to the document set of the selected host;  
35 ~~a.8 a.5.4) computer-readable program code devices con-~~  
36 ~~figured to cause a computer to, responsive to the se-~~  
37 ~~lected document containing at least one link:~~  
38 ~~a.8.1 a.5.4.1) selecting~~ at random a link from the  
39 selected document;  
40 ~~a.8.2 a.5.4.2) selecting~~ a document correspond-  
41 ing to the selected link;  
42 ~~a.8.3 a.5.4.3) selecting~~ a host corresponding to  
43 the selected document;  
44 ~~a.8.4 a.5.4.4) repeating~~ the operations of a.6  
45 ~~a.5.2) through a.9 a.5.4.3) until a first pre-~~  
46 determined condition is met; and  
47 a.9) ~~computer-readable program code devices configured to~~  
48 ~~cause a computer to, responsive to the selected document~~

not containing at least one link, repeat the operations of  
a.3) through a.9 a.5.4.4) until a second predetermined  
condition is met;

- b) computer-readable program code devices configured to cause  
a computer to determine a quality metric responsive to the  
number of documents encountered during the two-level ran-  
dom walk that link to the target document;
- c) computer-readable program code devices configured to cause  
a computer to determine a quality metric for at least one ad-  
ditional target document; and
- d) computer-readable program code devices configured to cause  
a computer to rank the quality metric of the first document  
with respect to the quality metrics of the additional target  
documents.

57. (Currently amended) A system for randomly walking through a hyper-  
text-linked document set comprising a plurality of documents, wherein at least a  
subset of the documents contain a plurality of links to other documents, each  
document being associated with a host, the system comprising:

- a) a host selector;
- b) a random document selector, coupled to the host selector, for  
selecting at random a document associated with the host;

- 8 c) a document retriever, coupled to the random document se-
- 9 lector, for retrieving the selected document; and
- 10 d) a link selector, coupled to the document retriever, for select-
- 11 ing at random a link in the retrieved document;

12 wherein, responsive to occurrence of a random event:

13 the host selector selects at random a host from among the previously

14 selected hosts;

15 the random document selector selects at random a document associ-

16 ated with the host; and

17 the document retriever retrieves the selected document; and

18 wherein, responsive to non-occurrence of the random event:

19 the link selector selects at random a link in the retrieved document;

20 and

21 the document retriever retrieves a document referenced by the se-

22 lected link; and

23 and wherein the link selector, the random document selector, and the

24 document retriever repeatedly their respective operations ~~selects at random a link~~

25 ~~and the document retriever repeatedly retrieves a document referenced by the se-~~

26 ~~lected link,~~ until a predetermined condition is met.

1 58. (Original) A system for measuring relative quality of a search engine  
2 index, comprising:  
3 a random walker, for performing a two-level random walk among  
4 documents within a document set;  
5 a determination module, coupled to the random walker, for, for each  
6 document encountered in the random walk, determining  
7 whether the document is indexed by the search engine index;  
8 and  
9 a results aggregation module, coupled to the determination module,  
10 for aggregating the results of the determination module.

1 59. (Currently amended) A system for measuring relative quality of a tar-  
2 get document in a document set, comprising:  
3 a random walker, for performing a two-level random walk among  
4 documents within a document set; and  
5 a determination module, coupled to the random walker, for deter-  
6 mining a quality metric responsive to the number of times the  
7 target document is encountered in the random walk.